REMARKS

A Petition for Extension of Time is being concurrently filed with this Amendment. Thus, this Amendment is being timely filed.

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims and the following remarks.

Status of the Claims

In the present Amendment, claims 19, 24 and 35 are amended. Also, in an effort to advance prosecution, withdrawn claims 14-18 are canceled, non-withdrawn claims 25 and 38-45 are canceled, claims 1-13 and 34 were previously canceled, without prejudice or disclaimer of the subject matter contained therein. Thus, claims 19-24, 26-33 and 35-37 are pending in the present application.

No new matter has been added with these claim amendments. Support for the amendment to claim 19 is found in at least paragraphs [0012], [0016], [0017], [0031] and [0032] and the examples of the U.S. Patent Application Publication No. 2002/0043316 A1 (the publication of this application). The amendments to claims 24 and 35 are obviously minor in character (e.g., claim 24 has proper antecedent basis; claim 35 would otherwise be redundant of claim 33).

Based upon the above considerations, entry of the present amendment is respectfully requested.

In view of the following remarks, Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims.

Substance of the Interview

Applicants thank Examiner McDonough and Supervisory Patent Examiner Lorengo and for their time, helpfulness and courtesies extended to Applicants' representative during the Interview of June 24, 2008. The assistance of the Examiner and SPE in advancing prosecution of the present application is greatly appreciated. In compliance with M.P.E.P. § 713.04, Applicants submit the following remarks.

The Interview Summary form amply summarizes the discussions at the Interview. Various ways of addressing the prior art rejections were discussed, and suggestions were discussed that may be drafted to cover particular aspects of the invention as not described by the prior art. In fact, claim 19 has been substantially amended as proposed to the Examiner during the Interview. The subject matter of claim 25 is incorporated into claim 19. Applicants have presented below the same such arguments presented during the Interview, but with more detail.

Issues under 35 U.S.C. § 102(b)

Claims 19-29, 31-41, 44 and 45 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Coffee *et al.* '916 (U.S. Patent No. 3,108,916) (see paragraphs 5-6 of the Office Action). Applicants respectfully traverse.

In the outstanding Office Action, the Examiner has maintained the rejection in view of Coffee '916, stating that the cited reference appears to disclose the same claimed ingredients and process of making; the claimed nitrogen content and diffusion depth are inherent properties; burden falls on Applicants to show that the prior art product is not the same as what is being claimed; and that Coffee '916 discloses identical grains and identical emulsion/solutions as the

present invention (see pages 2-3 and 4-6 of the Office Action). However, Applicants respectfully submit that the disclosure of the cited Coffee *et al.* '916 reference has been misunderstood. The following explanation is submitted to show that the instantly claimed process, as well as the recited ingredients and steps are not disclosed or taught in the Coffee '916 reference. Further, the following explains how the Coffee '916 method does not inherently disclose properties such as the actual diffusion or diffusion depth, as the final product would be affected by the actual steps and ingredients used in making the grains.

The Present Invention and Its Advantages

Of course, Applicants note the features as recited in currently pending claim 19. For instance, claim 19 is directed to a method of making functional, high-energetic material having a layered structure of the energetic plasticizer and polymeric desensitizer. Applicants add the following details.

The present invention is directed to a method for producing a functional, high-energetic material having a layered grain structure. An energetic plasticizer and polymer desensitizer are in the claimed functional, high-energetic material. The present production process includes the steps of providing a receptive grain in water and adding an energetic plasticizer in the form of a solution to the receptive grain. When the energetic plasticizer is added, the energetic plasticizer diffuses into the receptive grain and produces a layered structure of energetic plasticizer. In this first diffusion step, the diffusion depth is controlled by certain parameters, including changing the time of addition, time of exposure, and/or the pressure lowering amount. The diffusion of said energetic plasticizer is controlled to a depth of 100 to 500 microns. As a result, during the

diffusion process of the energetic plasticizer, a preliminary concentration profile is generated in the grain. This is schematically illustrated in **Figure A**[1] below.

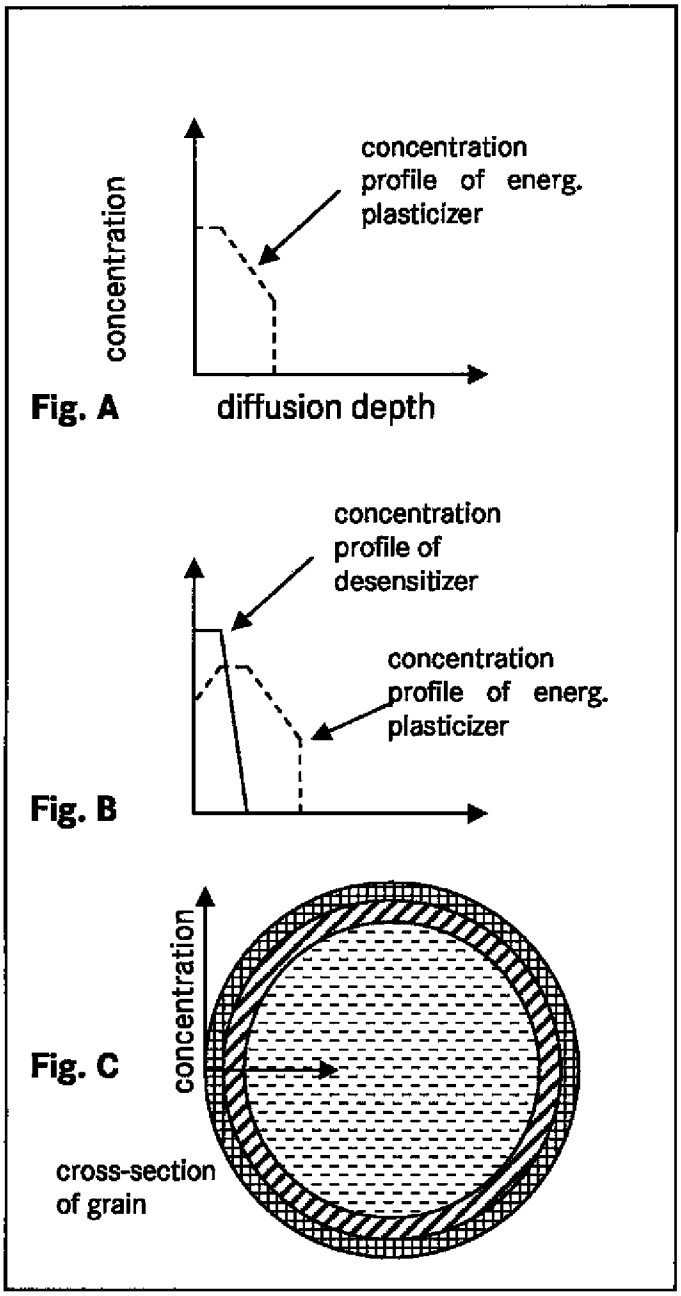


Fig. A

Fig. B

Fig. C

[1] The figures herein are for schematic purposes only and are not intended to limit the scope of the claimed invention.

Then, after the diffusion of said energetic plasticizer, a polymeric desensitizer is added in the form of an emulsion having water to the receptive grain. Then, in a second diffusion step, the polymeric desensitizer diffuses into the receptive grain in a controlled manner to produce a layered structure of said polymeric desensitizer. In other words, a second diffusion process is started when said polymeric desensitizer is added (see **Figure B** above). The diffusion depth of said polymeric desensitizer is also effected to a depth between 100 and 500 microns. Also during this second diffusion process, said energetic plasticizer is driven further into the grain, while at the same time said polymeric desensitizer is diffused "on top of the energetic plasticizer" into said grain (shown in **Figure B** above).

As a result, the concentration profile of said polymeric desensitizer is "narrower" (or the diffusion depth is smaller) than that of the concentration profile of said energetic plasticizer. The effect of this sequence of diffusion steps is that there are two layers below the surface of the receptive grain, wherein the topmost layer is said polymeric desensitizer and the deeper layer is said energetic plasticizer. Applicants also note that if the sequence of the diffusion steps was changed the sequence of the layers would change.

Further, Applicants respectfully point out that claim 19 refers to the same grain ("said grain") throughout the claim. This is clearly different from the Coffee '916 reference, which involves transformation of many small spherical grains into one single large rocket grain (see explanation below).

Applicants note that also in the presently claimed process, said grain (after the mentioned first and second diffusions) is polished with graphite. Again, "said grain" is being claimed

(wherein Coffee '916 discloses transformation of many small spherical grains into one single large rocket grain).

Accordingly, in the present invention, the energetic plasticizer and/or polymeric desensitizer are diffused into the absorptive, non-impregnated grains, wherein a layered grain structure is produced. The mentioned energetic plasticizer and polymeric desensitizer are impregnated at, e.g., a diffusion depth ranging from 100 to 500 μm. This in turn leads to certain advantages, including the production of a functional material having an improved and higher bulk density, which in turn leads to a higher energy content or potential (that can be converted to kinetic energy).

Applicants respectfully note that the diffusion process is not simply a consequence of putting two ingredients into the same reactor tank. Though the energetic plasticizer and polymeric desensitizer diffuse into the grain, it is important to note that the ingredients are selected such that they do not dissolve the grain but that they are able to perform a diffusion step to generate a layered grain structure. Further, selection of the appropriate solutions/emulsions enables the transportation or diffusion of the components. Applicants note that the diffusion depth influences the burning properties and the behavior of the ammunition, and such influences are clearly disclosed in the present specification (see, for example, paragraph [0016] at page 2 and paragraph [0032] at page 4 of the '316 published application). It is also disclosed in the present specification as to what parameters influence the diffusion depth and therefore the properties of the powder grain.

The disclosure of the cited Coffee '916 is now discussed below. Applicants first clarify the teachings of the Coffee '916, and give a brief discussion of a method related to Coffee '916

(which is U.S. Patent No. 2,916,775 by John J. O'Neill, Jr.; hereinafter referred to as **"O'Neill '775"**). While Coffee '916 does disclose an energizer and deterrent, Coffee '916 does not teach a process that leads to a layered structure in the grain as instantly claimed, nor does Coffee '916 disclose the same claimed steps. In fact, compared to the present invention, the cited Coffee '916 process is directed to a different process with different manufacturing steps utilizing different ingredients to attain a different product. After the discussion of Coffee '916, Applicants discuss the features of the present invention with respect to the cited reference.

The Problems and Solutions Thereto Disclosed in Coffee '916

Applicants note there is a difference when making grains for rockets versus making grains for small arms ammunition. Production of rocket grains has it own set of problems and proposed solutions (processes), as evident upon a reading of Coffee '916. In other words, the production of small grains is not the same as producing large grains as explained below.

The starting point of Coffee '916 is the difficulty with the production of large grains. As stated in the Coffee '916 specification at column 1, lines 13-20, if rocket grains (which are relatively large in size) are produced by extrusion, the curing and solvent removal is a problem. Thus, the objective of Coffee '916 is to solve such problems.

Coffee '916 states that such problems are overcome by using the plastisol process as taught in O'Neill '775 (see Coffee '916 at column 1, lines 20-24). According to the plastisol process, finely divided particles are mixed with a plastisol solvent of nitrocellulose plasticizer to form a "flowable paste" (see Coffee '916 specification at column 1, lines 25-29). The paste is formed into the large shape of the rocket grain and is consolidated (column 1, lines 29-32).

Also, with regard to the smaller propellant grains (and not the rocket grains), Coffee '916 provides a "surface coating" or "molecular external coating" as further improvement (column 1, lines 52-72; column 2, lines 14-15).

The cited Coffee '916 reference refers to the rocket grain production process which is disclosed in O'Neill '775 (see Coffee '916 at column 1, lines 20-32), and further explains the difficulties that arise when handling "*exceedingly small propellant powder particles*" (see column 1, lines 33-51 of Coffee '916). To overcome the problems of the prior art, Coffee '916 specifically teaches "*surface coating nitrocellulose propellant powder grains with a substantially non-volatile liquid ester . . .*" (see column 1, lines 70-72). The following diagram of **Figure D** shows how Coffee '916 cooperates with the prior art, including the mentioned O'Neill '775 reference:

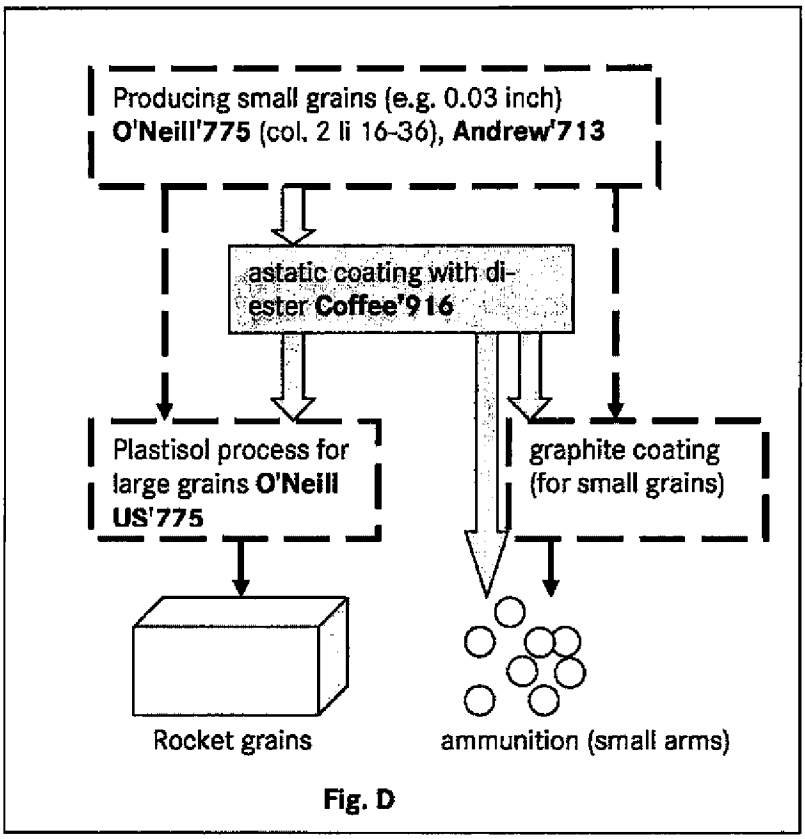


Fig. D

Coffee '916 also suggests that "*the present invention [i.e.* the coating by di-ester] *is applicable to any type of nitrocellulose based powder regardless of its size or shape*" (column 2, lines 62-64). This is evident from **Figure D** shown above. However, it is to be pointed out that for large rocket grains the coating only applies to an intermediate product, while for a small arms ammunition it applies to the end product. In rocket grain production, the coated nitrocellulose powder grains are <u>further processed</u> by the plastisol process (which is described in detail in O'Neill '775). Only the nitrocellulose grain which is not subjected to the plastisol process keeps its shape and may therefore be used for small arms ammunition. Thus, there is a difference between the rocket grain application and that of small arms.

For performing the plastisol process, which is used only for producing large rocket grains, the coated propellant powder grains are mixed with a plastisol solvent (column 2, lines 65-68). The plastisol solvent has a relatively great solving power at elevated temperatures (column 2, lines 69-70). This is necessary because in the course of the plastisol process the nitrocellulose grains have to be dissolved (see discussion of O'Neill '775 below). So the plastisol solvent might have the effect of a deterrent or an energizing modifier (column 2, line 72 to column 3, line 1), and is selected such that it can perform its function, namely dissolve the nitrocellulose grains. This is not the same as diffusion. Any such ingredients used in the plastisol solvent are not used in the same manner as instantly claimed.

The Teaching of O'Neill '775: Two process phases

It is essential for the understanding of the Coffee '916 patent to understand how the plastisol process disclosed in O'Neill '775 works. O'Neill '775 discloses:

I. a process for producing finely divided dry nitrocellulose pellets (column 3, line 51 to col. 4 line 22); and

II. a process (or the plastisol process) for producing a large rocket grain based on the dry nitrocellulose pellets (column 4, lines 23-69).

The following diagram **Figure E** shows the first mentioned process **I** for producing finely divided dry nitrocellulose pellets. It is evident that process **I** has nothing to do with the present invention.

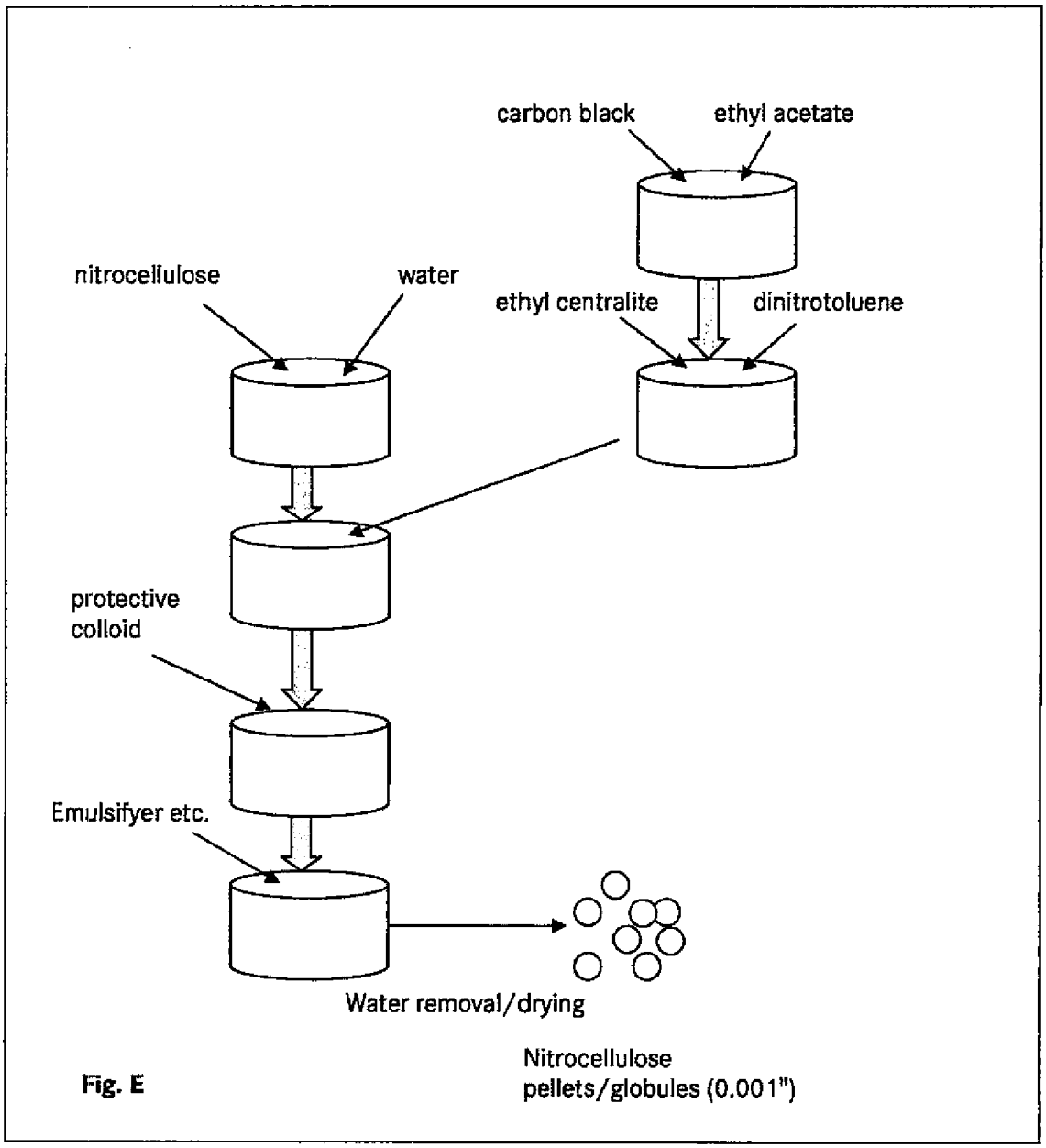
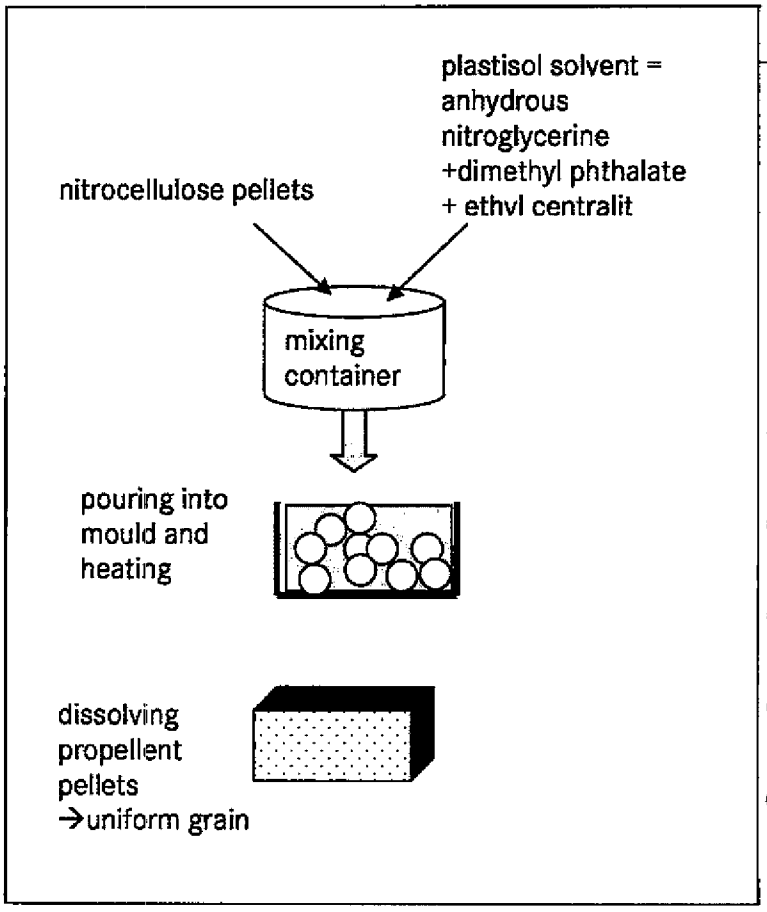


Fig. E

The diagram below contains an excerpt from column 4 of O'Neill '775 as well as a picture summarizing such a description. In other words, the diagram below is a visualization of the second phase of the rocket grain production in O'Neill '775 (which is also described in Coffee '916), namely the plastisol solvent process:



formation thereof.

About 56.18 parts by weight of spherical pellets of propellant such as prepared by the foregoing treating steps are then placed in a sigma blade mixer and the system is evacuated to an absolute pressure of about ten millimeters of mercury and so held for about sixteen hours. Meanwhile, about 37 parts by weight of a substantially anhydrous plastisol solvent, composed of 74% by weight nitroglycerine, 25% by weight dimethyl phthalate and 1% by weight ethyl centralite, is placed in a vessel and the vessel evacuated to an absolute pressure of about 10 millimeters of mercury and so maintained for about sixteen hours. The solvent is then added to the propellant in the mixer and the mixer operated to intimately mix the solvent and propellant, while the vacuum is maintained to prevent entrapment of air. After the solvent and propellant are uniformly mixed, the mixture is then shaped by carefully pouring to avoid entrapment of air into a mold formed of nitroglycerine-resistant plastic such as cellulose acetate, methyl methacrylate, or ethyl cellulose. Inasmuch as the plastisol solvent has a specific gravity of about 1.5, the percent by volume of plastisol solvent in the mixture is about 41.3%.

The mold containing the mixture of solvent and propellant is then placed in an oven, heated to about 75° C. and maintained at this temperature until the propellant is substantially dissolved by the solvent and the grain has set up. This solution and setting up of the grain is readily accomplished in a relatively short time, but for instance, may be conveniently let set over night. The exact time of such heat treatment depends, of course, upon the activity of the solvent, the particle size of the propellant, and the effective resistance of the surface of the propellent grains, hereinbefore described as "case hardening." For instance, utilizing the propellant and plastisol solvent described above, the mixture, if let stand at the relatively low temperature of about 22° C. will ordinarily set up in about 21 hours. When the grain has set up it is permitted to cool to room temperature and is removed from the mold.

Rocket powder grains prepared in accordance with the foregoing example are substantially free of undesirable voids, are substantially uniform in composition throughout the grain, and have the strength and other physical properties requisite for rocket powder grains. It will be apparent that the method is relatively simple lending itself to mass production and that no costly apparatus such as is needed for developing high pressures

As can be seen, a grain having a substantially uniform composition is produced. First, the finely divided nitrocellulose pellets are mixed with the plastisol solvent, which is anhydrous. Then, in the mixing container, a flowable paste is produced. No dissolution of the grains takes place at this stage. After the flowable paste is made, the paste is cast into the mould. The temperature is increased to a level at which the nitrocellulose is dissolved by the plastisol solvent (see section (i) below). After cooling and setting, the material in the mould is uniform throughout the grain (see section (ii) below).

(i) O'Neill '775: plastisol solvent dissolves nitrocellulose grains

The plastisol solvent has to be selected and mixed with the pellets in such a way that the nitrocellulose is dissolved. Dissolution takes place during curing. Specifically, O'Neill '775 clearly points out that curing of the mixture in the mould results in dissolving the pellets: "*The mould containing the mixture of solvent and propellant is then placed in an oven, heated to about 75°C and maintained at this temperature, until the propellant is substantially dissolved by the solvent and the grain has set up.*" (see column 4, lines 45-49).

O'Neill '775 also points out that the time for the set up is chosen so that the pellets are dissolved, namely the time needed for the solution and setting depends on the activity of the solvent, the particle size and "the effective resistance of the surface of the propellant grains, hereinbefore described as 'case hardening'" (column 4, lines 49-58): "*Although the spheres of propellant may be of any desired size, larger diameter spheres require relatively longer periods of time in order to effect their solution . . .*" (column 2, lines 43-45).

Therefore, the plastisol solvent has to be selected and mixed with the pellets in such a way that the nitrocellulose is dissolved (column 2, lines 51-56). Thus, the plastisol solvent is used to dissolve the nitrocellulose grains during the plastisol process, which is not the same as the instantly claimed diffusion of the energetic plasticizer and polymer desensitizer.

(ii) O'Neill '775: plastisol process produces uniform, homogenous composition

It is a consequence of dissolving of the nitrocellulose grains of O'Neill '775 that the composition in the mould becomes uniform and homogenous. This is also confirmed by the teaching of O'Neill '775: "*Rocket powder grains prepared in accordance with the foregoing*

example are substantially free of undesirable voids, are substantially uniform in composition throughout the grain . . ." (see column 4, lines 62-65) (Applicants' emphasis added). This clearly means that the plastisol solvent process transforms the flowable paste containing small pellets (or grains) into a homogenous and uniform mass, i.e., a block ("rocket grain") of nitrocellulose/nitroglycerine.

(iii) How dissolution of nitrocellulose is reached; minimizing moisture (water)

It is an essential step in the plastisol process of O'Neill '775 that the mixture of nitrocellulose grains and plastisol solvent is heated to an elevated temperature after the paste has been given the desired shape. Applicants note column 3, lines 36-41, which is reproduced below for the Examiner's convenience:

grain. After the mixture has been given the desired shape, heat is applied to elevate the temperature of the mixture to a temperature preferably in the range of about 50° C. to 90° C. and such temperature is maintained for a time sufficient to cause solution of the propellant and setting-up of the mixture, at which time the temperature may be reduced. As a general rule, the higher

Thus, the plastisol process clearly avoids any liquids, and in particular water as stated at column 3, lines 22-25: "*In operation the plastisol solvent is preferably desiccated or otherwise treated to reduce any traces of moisture to a minimum, and both the propellant and plastisol solvent are preferably evacuated prior to mixing ...*".

Accordingly, there are significant differences between the process of Coffee '916, which includes the plastisol process (of O'Neill '775), and the process of the present invention. The outstanding rejection is now addressed below.

Significant Differences Between the Present Invention and the Process of the Cited Coffee '916 Reference

In the outstanding Office Action, the Examiner has maintained the rejection in view of Coffee '916, stating that the cited reference appears to disclose the same claimed ingredients and process of making; the claimed nitrogen content and diffusion depth are inherent properties; burden falls on Applicants to show that the prior art product is not the same as what is being claimed; and that Coffee '916 discloses identical grains and identical emulsion/solutions as the present invention (see pages 2-3 and 4-6 of the Office Action).

Applicants respectfully traverse in that the instantly claimed process, as well as the recited ingredients and sequence of steps, are not disclosed or taught in the Coffee '916 reference. Further, Coffee '916 does not inherently disclose properties such as the actual diffusion or diffusion depth, as the final product would be affected by the actual steps and ingredients used in making the grains.

(i) The instantly claimed ingredients, the diffusion thereof, and diffusion depth versus Coffee '916

Applicants are aware of the following arguments that might look to be opposed to the patentability of the present invention, as some of these points were also mentioned by the

Examiner during the recent Interview:

- The ingredients of the invention are not different from the Coffee '916 reference since both use nitrocellulose (Coffee '916, column 4, line 4), nitroglycerine (Coffee '916, column 3, line 2) and ester (Coffee '916, column 3, line 8);
- It is known that diffusion in general is a basic physical process that takes place in real physical and chemical systems whether you name it or not, e.g., whether you are aware of it or not;
- Applicants have not provided evidence that there is no diffusion (i.e., no diffusion at all) when performing the process of Coffee '916 (and O'Neill '775);
- It is therefore assumed that there IS diffusion in the process of Coffee '916; and
- The pending claims merely mention diffusion (of unspecified extent) in combination with known ingredients, which is not new.

Applicants believe that the above points do not apply to the present invention for the following reasons.

The invention is not directed to the general physical notion of "diffusion" but to a particular diffusion step(s) that is a controlled, technical process for generating a layered structure in the grain that depends on the parameters of "adding times," "exposure times" and/or "pressure lowering moments."

Further, the diffusion depth in the claimed range of 100 – 500 μm is not the automatic result of putting the ingredients together, but instead is the result of the controlled diffusion steps. If the person skilled in the art does not properly control the diffusion steps, the diffusion depth might well be below or above the claimed range.

Even if there is some (unspecified and uncontrolled) diffusion in the process of Coffee '916, there is no process step in the cited reference to make sure that the result of the disclosed production process is a grain with two layers, namely a layer of energetic plasticizer and a layer of polymeric desensitizer as instantly claimed.

In addition, even if it was assumed (without any clear evidence) that the plastisol process would inherently produce diffusion of the plastisol solvent (which might be an energizer or a deterrent) into the small spherical grains, this would not anticipate the presently claimed invention. The reason is that Coffee '916 teaches dissolving the grains by selecting the appropriate interaction time (as explained above). There is no hint in Coffee '916 to disrupt the process of dissolution (i.e., to deviate from the goal of the plastisol process) and to expect to be able to generate in such a way two layers in the grain.

It is to be pointed out that, generally speaking, the process of controlled diffusion and the process of dissolution are substantially different and a person skilled in the art would not consider that the controlled diffusion process is merely a section of the dissolution process (plastisol process).

Finally, Applicants respectfully refer the Examiner to claim 19 as shown herein and the attached Rule 132 Declaration (executed by co-inventor Ulrich Schädeli). The importance of the instantly claimed diffusion and diffusion depth can be seen from the comments in the attached Rule 132 Declaration. For instance, as stated in the Rule 132 Declaration, by varying the adding times, exposure times and/or pressure lowering moments, it is possible to control diffusion depth. In other words, Coffee '916 does not inherently disclose the instantly claimed diffusion, and

specifying the diffusion depth in the claimed range differentiates the present invention from the general notion of diffusion.

Thus, it is believed that the concerns of the Examiner have been sufficiently addressed. Reconsideration and withdrawal of this rejection are respectfully requested.

(ii) The instantly claimed sequence of steps

Coffee '916 does propose the use of an energizer and a deterrent. However, as explained above, the steps of how to introduce these ingredients into the grain are different from the present invention. While the present invention is directed to adding the solution of energetic plasticizer to a watery suspension of nitrocellulose grains, Coffee '916 instead teaches using an energizing modifier or a deterrent as a plastisol solvent. Applicants note that discussion of the plastisol process as specifically discussed O'Neill '775. As mentioned, the plastisol solvent is desiccated to reduce any moisture (or void liquids). In other words, the plastisol solvent is not used in combination with water, and moisture in the plastisol process is to be minimized as discussed above. This is clearly in contrast to the present invention which recites a solution or emulsion with water.

Furthermore, in the present invention, adding a solution of energetic plasticizer to the watery suspension allows diffusion into the grain (as even claimed by the invention). But in Coffee '916, adding a plastisol solvent to the coated nitrocellulose pellets leads to a dissolution of the grains and to a uniform solid block (or rocket grain). This is a fundamental difference between the presently claimed invention and the process of Coffee '916. Applicants again respectfully refer the Examiner to **Figure A** above.

In addition, while adding an emulsion of polymeric desensitizer after diffusion of the energetic plasticizer produces a second layer in the grain (as claimed by the invention), Coffee '916 does not foresee a particular sequence of mixing of the energetic plasticizer and/or polymeric desensitizer. As a consequence, Coffee '916 does not teach a process that leads to a layered structure in the grain wherein the energetic plasticizer is deeper in the grain surface than the polymeric desensitizer. Applicants respectfully refer the Examiner to claim 19 as shown herein, wherein diffusion of the energetic plasticizer as well as diffusion of the polymeric desensitizer are being instantly claimed. These are more significant differences between the invention and Coffee '916.

As far as Coffee '916 discloses using an energizer, this energizer is not diffused into the grain but either is incorporated in the initial nitrocellulose material or mixed with it after the di-ester coating and prior to the plastisol process. For the skilled person, "mixing" refers to a different procedure than "diffusing" and "mixing" does not result in a layered grain structure. In particular, the sequence of steps disclosed by Coffee '916 would not result in a multi-layered structure in a nitrocellulose grain, where the inner layer is an energetic plasticizer and the outer layer a polymeric desensitizer.

As far as Coffee '916 discloses using an emulsion, this is for use with the di-ester (column 2, lines 36-43). Coffee '916 does not teach diffusing an energizer in an emulsion into the grain in the first place. Further, Applicants note the problems with the Coffee '916 disclosure as discussed in detail above.

(iii) Diffusion Depth Is Not Inherent Property

In the Office Action at page 5, the Examiner states:

> Applicants argue that the emulsion diffuse to a depth of 100-500 microns into the surface. This is a property of the composition and since properties of a compositor are inseparable from the composition itself, one skilled in the art would expect the same to happen for the reference composition absent any

This appears to be directed to pending claim 25 (which subject matter now appears in claim 19). Applicants respectfully traverse.

First of all, it should be pointed out that no product is defined simply by the ingredients (substances) contained in the product. Even in everyday life this is true: It makes a big difference for the consistency, appearance and taste of a bakery product whether the sugar or butter is homogenously distributed in the cake dough or whether it is only on the surface or in filling layers of the cake. Using the same ingredients does not mean getting the same product. The reason is that it is important how the ingredients are processed (at what sequence, at what temperature, at what consistency, etc.). There are many different cakes that can be made from flour, butter and sugar.

Similar principles are true in chemistry and particularly in propellant powder production. In particular, and as explained in detail above, it does make a difference in the effect whether or not the energetic plasticizer and the deterrent are uniformly distributed in the grain or concentrated on the grain surface. It is clearly wrong to believe (as asserted in the Office Action) that the diffusion depth is "a property of the composition". The diffusion depth can be controlled by the process parameters (temperature, time, concentration).

If the diffusion depth was a property of the composition there were no integrated circuits in silicon because the semiconductor technology makes use of the fact that the diffusion depth is NOT a fixed parameter inseparably linked with the composition, but is a parameter that can by modified by choosing the appropriate process parameter (time, temperature, concentration). This is true also in the field of propellant powder production.

Further, Applicants respectfully traverse as these comments are in direct contrast to the disclosure in Coffee '916 at column 2, lines 13-14 (". . . they do not penetrate the surface of the grains. They are presently only as a molecular coating.").

Accordingly, Applicants respectfully request reconsideration as to how the process steps can lead to a different product, and that the claimed diffusion depth is not an inherent property.

(iv) Plasticizer and desensitizer in emulsion

In the Office Action at page 5, second full paragraph, the Examiner states:

> Applicants argue that their composition is further different by the fact that they use the plasticizer and desensitizer in solution. This is not persuasive as the reference also teaches using these in a solution/emulsion (column 2, lines 27-48).

Applicants respectfully traverse.

The cited text in Coffee '916 (column 2, lines 27-48) does not mention using "these [i.e. plasticizer and desensitizer] in solution/emulsion". Rather, the following is specifically disclosed:

> with water prior to the coating operation. It is preferred, however, to treat an aqueous slurry or suspension of the powder grains to be coated with an aqueous emulsion or suspension of the liquid di-ester in a continuous manner. This is most readily accomplished by dewatering

Applicants respectfully submit that "An aqueous emulsion or suspension of the liquid di-ester" is not to be confused with a "solution." Instead, a "solution" refers to a clearly different state of matter than a "suspension." This is also basic knowledge to a person having ordinary skill in the art.

Further, the plastisol solvent described in Coffee '916 has the property to solve the powder (only) at elevated temperatures. As explained above, the plastisol is heated to an elevated temperature during the process. Therefore, the grains are dissolved at the end of the plastisol process and the resulting rocket grain has a uniform composition (i.e., does not have a layered structure).

Applicants respectfully point out that if the grains are not treated by the plastisol process, Coffee '916 simply teaches coating any conventional grain by di-ester (column 2, lines 55-60):

> like. Although the present invention is concerned primarily with the treatment of such casting powder, the qualities of standard small arms ammunition propellent are also materially improved when coated with the di-ester of the present invention. The present coating materials can be used to replace or augment the conventional graphite glaze on commercial and military propellents.

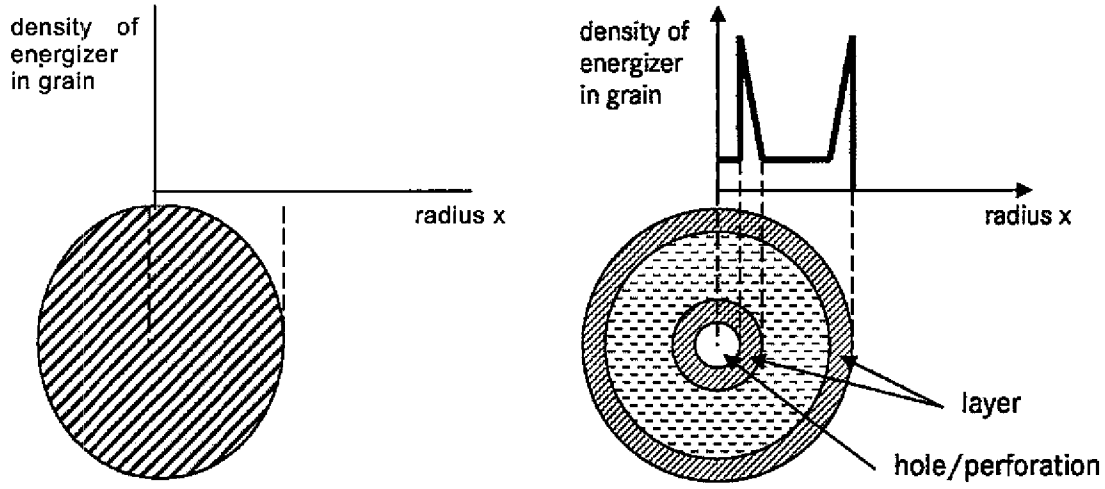
That means, as far as Coffee '916 teaches the use of the coating process, this only refers to standard ammunition. For standard ammunition, Coffee '916 does no teach using an energizer and deterrent.

(v) Comments in Office Action Regarding "higher density and energy"

In the Office Action at page 5, the Examiner also asserts:

> evidence to the contrary. With regards to the higher to the higher density and the higher energy content, this is expected as to fill an empty void with material will increase the density of the material and the more material in a given volume the more energy that can be derived from that volume.

Applicants respectfully submit that it does matter in which way (i.e., layered or uniform) the energetic material is present in the grain. As explained above, the present invention is directed to a layered structure, whereas Coffee '916 discloses uniform distribution of its components. The present invention does not teach filling "an empty void with (energetic) material" to increase the density of material and of energy "that can be derived from that volume". Furthermore, the treatment of the claimed invention does not fill the perforations ("voids") in the grain with energizer. In contrast, the energizer is diffused into the surface of the grain. The invention teaches to distribute the energetic material in a particular way namely to diffuse it into the surface (diagram on next page):



Coffee (uniform) **Invention** (layered)

Compared to the present invention, Coffee '916 is directed to different concentrations and total amounts of energizer that are introduced. Further, for the burning rate of the grain and for the rate of gas and heat generation, it does make a great difference whether the additional energizer is structured in layers or is distributed uniformly. Coffee '916 only teaches a homogenous (= uniform) distribution of energizers ("incorporated with the nitrocellulose"). Also when the energizer is mixed with the already coated powder, i.e., prior to the plastisol process this will lead to a uniform distribution because the curing of the plastisol process inherently provides dissolution of the grains and a uniform structure of the composition (see the Coffee '916 specification at column 3, lines 50–57). This is contrast to the present invention as discussed in detail above.

(vi) Coffee '916 Does Not Use Solutions

Also in the Office Action at page 5, the Examiner states:

> Applicants argue that their composition is further different by the fact that they use the plasticizer and desensitizer in solution. This is not persuasive as the reference also teaches using these in a solution/emulsion (column 2, lines 27-48).

The word "solution" does not occur at all in column 2, lines 27-49 of Coffee '916. Instead, the terms "suspension" and "slurry" are disclosed, which refer to the mixture of water and nitrocellulose lacquer and should not to be confused with "solution":

> r. This is most readily accomplished by dewatering a aqueous slurry of the powder grains in a continuous centrifuge and then adding an aqueous emulsion of the oating material to the centrifuge. The emulsified di-

Thus, Applicants respectfully traverse the Examiner's assertion. While it is true that Coffee '916 teaches the use of a di-ester (which may be a deterrent) in an aqueous emulsion (column 2, lines 40-45), this process step has a different function and is in a different sequence of its process (see detailed explanations above).

(vii) Coffee '916 Using Additional Steps/Ingredients

The Examiner refers to the "comprising" language of claim 19 (see the Office Action at page 5, first full paragraph). In response, Applicants note that Coffee '916 still does not disclose all instantly claimed features, including the step of adding the energetic plasticizer in the form of a solution to the receptive grain.

(viii) Summary of Key Distinctions

Thus, in summary, the present invention is directed to diffusion of the energetic plasticizer and diffusion of the polymeric desensitizer to produce a layered structure. Also, as recited in claim 19, the present invention is directed to a particular sequence of steps including diffusion of the mentioned ingredients. In contrast, Coffee '916 does not (inherently) disclose the claimed diffusion or diffusion depth. Also, diffusion can be controlled via certain parameters. Applicants also note the attached Rule 132 Declaration establishing just that. Also in contrast to the present invention, Coffee '916 employs a plastisol solvent, wherein its grains are dissolved to form a uniform solid block (or rocket grain). Further, Coffee '916 fails to disclose or teach a particular sequence of diffusion as instantly claimed. As a consequence, Coffee '916 does not teach how to even make a layered structure as instantly claimed. The cited Coffee '916 reference certainly does not disclose an energetic plasticizer being deeper in the grain than that of the polymeric desensitizer. Furthermore, the "mixing" disclosed in Coffee '916 does not carry the same meaning as "diffusion" as claimed. Finally, it does make a difference in the effect whether or not the energetic plasticizer and the deterrent are uniformly distributed in the grain, versus being concentrated on the grain surface.

Thus, this rejection has been overcome as Coffee '916 does not disclose all instantly claimed features. Anticipation requires that "each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949 (Fed. Cir. 1990) (citing *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). Here, there is no disclosure of all features as instantly claimed in Coffee '916.

Instantly Pending Dependent claims

Applicants also request specific consideration of the pending dependent claims. Other than assertions of inherency, it appears that the features of the dependent claims have not been specifically accounted for in the Office Action.

Conclusion

Accordingly, Applicants respectfully submit that this rejection has been overcome. Reconsideration and allowance of the pending claims are respectfully requested.

Issues under 35 U.S.C. § 103(a)

Claims 30, 42 and 43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Coffee *et al.* '916. Applicants respectfully traverse, and reconsideration and withdrawal of this rejection are respectfully requested.

M.P.E.P. § 2143 set forth the guidelines in determining obviousness. First, the Examiner has to take into account the factual inquiries set forth in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which has provided the controlling framework for an obviousness analysis. Second, the Examiner has to provide some rationale for determining obviousness, wherein M.P.E.P. § 2143 set forth some such rationales that were set forth in the recent decision of *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007).

For this rejection, Applicants respectfully refer the Examiner to the technical explanation and accompanying arguments above. Such arguments apply to this rejection as well. For instance, the present invention employs diffusion of an energetic plasticizer and polymeric

desensitizer, which leads to a layered grain structure. Coffee '916 does not disclose such a process and/or use ingredients in this way. Further, Coffee '916 leads to a different product (e.g., uniform rocket grain) and gives no guidance in achieving the present invention. In other words, there is no reason or rationale for the skilled artisan to modify the Coffee '916 disclosure to achieve what is being instantly claimed.

Further, in the outstanding Office Action, the Examiner states that the coating Coffee '916 method does penetrate the surface, and that the patentee himself may be incorrect instating that its materials do not penetrate the surface (see page 4, last three lines of the Office Action). Applicants respectfully traverse as these comments are in direct contrast to the disclosure in Coffee '916 at column 2, lines 13-14 (". . . they do not penetrate the surface of the grains. They are presently only as a molecular coating."). Regarding a rejection under 35 U.S.C. § 103(a), any cited reference must be considered in is entirety, *i.e.*, as a whole, including those portions that would lead away from a claimed invention. *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 U.S.P.Q. 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Accordingly, Applicants respectfully submit that this rejection has been overcome. Reconsideration by the Examiner and allowance of the pending claims are respectfully requested.

Conclusion

A full and complete response has been made to all issues as cited in the Office Action. Applicants have taken substantial steps in efforts to advance prosecution of the present application.

Applicants respectfully request that a timely Notice of Allowance issue for the present case. ***If for any reason the above is insufficient to warrant such a Notice***, Applicants respectfully request the Examiner to contact Applicants' representative (Eugene T. Perez - Reg. No. 48,501) at the contact information give below. Further, should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Applicants' representative to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.147; particularly, extension of time fees.

Dated: ***Monday, July 7, 2008***

Respectfully submitted,

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Attachment: Declaration under 37 C.F.R. § 1.132 (total of 3 pages)

CG/ETP/las